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What drives the distribution in nature of 3*T* vs. 2M_1 polytype in muscovites and phengites? A general assessment based on new data from metamorphic and igneous granitoid rocks

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Abstract

Petrologic, chemical, and polytype data are presented for dioctahedral potassic micas from K-feldspar-bearing metamorphic and igneous rocks of acidic composition unaffected by high-pressure (HP) conditions. The paper aims to demonstrate that: (1) under non-HP conditions, in both metamorphic and igneous plutonic environments, a given bulk-rock compositional constraint imposes a more or less marked phengitic composition to dioctahedral potassic mica; and (2) this muscovite crystallizes as 2M_1, notwithstanding its phengitic composition. The samples (157 in number) are from widespread provenances. We conclude that the growth of 3*T* polytype of muscovite is not a function of mica composition. This is consistent with the recent crystallographic knowledge on polytypism, cation ordering, elastic properties, and structural deformational mechanisms of muscovite, which address the stabilization of 3*T* with pressure.

Keywords: Muscovite, phengite, celadonitic substitution, polytypism, 2M_1, 3*T*, pressure-polytype relationship, mica chemistry, polytype relationship, petrologic mineralogy